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VIA FAX AND MAIL

January 23, 1991

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SSWP2-0631
24 JAN 91

Mr. Mark Richer
Chairman, SS/WP-2
PBS
1320 Braddock Place
Alexandria, Virginia 22314-1698

Dear Mark,

In the SS/WP-2 meeting of January 18, 1991 you solicited inputs from all proponents on the desirability of conducting some kind of generic digital field test before the main field test of the selected proponent system in 1992.

As it is not clear what this test would entail, we will respond to two possibilities.

- I. Conduct a 16 QAM field test with standard generic digital modems of 20 Mbit/sec capacity and measure BER in the presence of NTSC cochannel or other channel impairments.

Zenith would not support a test of this nature because of the following:

- a. From our own interference and service area analysis we already know that standard 16 QAM cochannel encoding will not provide a low enough carrier to interference threshold to result in a commercially attractive service area.
- b. Nonstandard digital channel encoding systems, specialized to accommodate the adverse NTSC cochannel interference environment, are likely to be part of some proponent's systems.
- c. Carrier acquisition and data acquisition under the necessarily very low carrier to interference conditions are very non-linear phenomena. Therefore, the various proponent's approaches to acquisition are likely to show significant differences in performance.

Mr. Mark Richer
January 23, 1991
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- d. Source and channel encoding and channel equalization are integrally related in the systems optimization process. Meaningful results can only be expected from complete integrated systems tests.
 - e. We would consider our share of this a waste of our limited time and resources.
- II. Conduct a channel characterization test by means of a pseudo-random code piggy back in the VBI of an NTSC transmission.

Extending tests of this kind beyond what NTIA has released from the tests in Denver could provide interesting and useful engineering information. However, there is not much time left and we feel that further analysis and processing by ITS/NTIA of the Denver data, including (software) channel equalization, C/N analysis and transformation into the frequency domain could provide as much information much quicker. In particular, it should be examined if the existing ITS/NTIA data base can provide more useful information on time and location variability of the received signals.

At this point we even question if the inclusion of this test in the final field test is worth the estimated \$100K to \$150K in extra cost.

Sincerely,

for Wayne Luplow (on vacation)



JOUKE RYPKEMA

WCL/JCR/e

cc: Jules Cohen

TAL

FEDERAL COMMUNICATIONS COMMISSION SS - 0282
06 Feb 91
ADVISORY COMMITTEE ON
ADVANCED TELEVISION SERVICES

WORKING PARTY 3: ECONOMIC ASSESSMENT

THIRD REPORT

JANUARY 1991

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EXECUTIVE SUMMARY

The third phase of the work of SS WP-3 is reported here. Some twenty-two meetings in total have been held to date. As recommended by our charter, we formalized our relationships with the Planning and Implementation Subcommittees during this phase by spending most of this period in joint working meetings with related Working Parties from both Subcommittees.

The scope of our work broadened considerably during this phase. A dramatically changing U.S. environment has seen: intensification of broadcast ATV system studies; rapid progress in the development of a digital HDTV production standard; a major reorientation in U.S. efforts - now directed toward development of an all-digital ATV transmission implementation for terrestrial, cable and DBS distribution; a growing involvement of the U.S. computer industry in HD television standards development activities; and increasing discussion of widescreen 525 systems as an inevitable component of the actual marketplace transition to a future full HDTV service. All of these exposed new and challenging economic considerations for WP-3.

The topic of transition scenarios for broadcasters pre-occupied WP-3 in this phase of our work. Disparate studies on elements of possible future broadcast ATV infrastructures are growing within a variety of U.S. HDTV-related committees - with no one committee grappling with it all. However, WP-3 sees an inevitable role in attempting to do just that. We feel this to be a necessary prerequisite to any realistic cost assessment of future ATV stations and networks.

Our system block diagrams of future ATV broadcast infrastructures underwent considerable refinement as a consequence of many of these developments. Attendant cost issues continued to be identified.

Simultaneously, we have attempted to grapple with defining a marketplace model of how ATV receivers will enter the U.S. home; the likely ATV program delivery media and the sequence in which they might be implemented in the U.S.; the possible sources of ATV programming - especially in the early years; the elapsed time to achieve one percent market penetration; the shape of the growth curve following this critical penetration level; and the influence of parallel ATV growth scenarios in other regions of the world - notably Japan and Europe.

A serious void in the collective ATV analysis of the Advisory Committee was exposed. The vital importance of knowing what the U.S. consumer will acknowledge as a dramatic enhancement to the overall television viewing experience (that is - the marketplace definition of what constitutes an ATV image sufficient to propel successful adoption of a new television service) was uncovered within the dialogue between SS WP-3 and PS WP-5. The conviction that a major omission in ATV studies is manifesting itself gained momentum at almost the same time that PS WP-7 on Audience Research reported its inability to find a way to implement the research

progr they identified as having vital relevance to the unfolding ATV analysis.

Significant design (and cost) criteria for both the ATV receiver and the ATV broadcast plant are bound up in the issue of the ATV images presented to the consumer. The proposed ATTC testing program (objective and subjective) will furnish the requisite technical information on the proponent systems - but will yield little that will presage what will happen in the marketplace and to the macroeconomics of a U.S. conversion to ATV.

The next phase of WP-3's work will continue the examination of:

- o Terrestrial broadcasting system block diagrams - in conjunction with the ATV proponents and other related industry HDTV committees
- o Transition scenarios
- o Assumptions underlying PBS and CBS submissions and further refining of their economic models
- o Assumptions underlying WP-5 ATV receiver penetration models with continuing refining of the economic model

and will initiate a first system study of the new digital ATV proposals.

1.0 INTRODUCTION:

The FCC ACATS Systems Subcommittee formed Working Party 3 in January 1988 and tasked us with the following:

Establish estimates of the costs associated with the distribution of ATV by various systems, with inputs from the Planning and Implementation Subcommittees. An assessment of the technological viability and economic feasibility of each system will be established.

In this report to the Systems Subcommittee, we will summarize the work accomplished to date. We will report on the challenges exposed to assessing costs associated with ATV systems - recognizing that they are inextricably intertwined within a multi-faceted macroeconomic scenario.

As will become evident, WP-3 finds itself now deeply involved in **ATV Systems Analysis** as we attempt to identify details of a future U.S. broadcast infrastructure. New ATV system concepts, particularly as applied to broadcast stations and networks, are arising from a number of quarters - many hypothetical, others apparently sound in concept but totally unsupported by any practical product development or system implementation. Indeed, while WP-3's focus remain that of economic assessment we have, of necessity, become a catalyst for "revisionist" thinking on future television systems, ATV implementation, and transition scenarios. There appears to be no circumventing our grappling with the broadcast system of the future - if any credible ATV cost assessment is to emerge. The recommendation of our original charter - that we assess **technological viability**, in addition to economic feasibility - acquired a new recognition among the members of WP-3 during this past year.

2.0 BACKGROUND:

This is the third report of Working Party 3. A summary of our three work phases to date and how they relate to the Interim Reports are as follows:

- Phase 1: February 24, 1988 - February 7, 1989**
- Eleven** WP-3 meetings
- Second Interim Report (WP-3 first report)
April, 1989
- Phase 2: February 7, 1989 - March 14, 1990**
- Six** WP-3 meetings
- Third Interim Report (WP-3 second report)
March, 1990
- Phase 3: March 14, 1990 - January 31, 1991**
- Five** WP-3 meetings
- Fourth Interim Report (WP-3 third report)
April, 1991

Our first report to the Systems Subcommittee on March 9, 1989 described how WP-3 structured itself into seven Specialist Groups - each tasked with developing preliminary economic models for each of the delivery media possibilities for ATV.

The second report of WP-3 in January, 1990 to the System Subcommittee (in preparation for the 1990 Third Interim Report) described the focussing of our efforts on the terrestrial broadcasting infrastructure. Block diagrams were developed for a typical local station - and for a generic broadcast network. These were designed to allow examination of the impact of each ATV proponent proposal on the broadcast infrastructures. A first pass analysis of the cost of conversion to HDTV for a single local station was produced - based on current costs of contemporary HDTV production equipments.

The second phase also saw the first joint meetings with Working Party 5 (Economic Factors and Market Penetration) of the Planning Subcommittee. These meetings attempted to apply macroeconomic models to the more system specific work of WP-3.

This third report summarizes the status of our overall work to date. Continuing focus on terrestrial ATV broadcasting has been maintained throughout this third phase while we simultaneously attempted to deal with ever widening macroeconomic issues. This report is significant in that our studies advanced within an environment which became very fluid as a consequence of a number of swiftly unfolding events.

3.0 S. HDTV/ATV ENVIRONMENT DURING PHASE 3:

The international HDTV/ATV debate broadened during the period since the last (Third) Interim Report - a consequence of multiple unrelated global developments. But, nowhere has this been more dramatically evident than here in the U.S. Events moved rapidly - to a degree where certainly, SS WP-3 incurred some profound alterations to the nature and scope of our work. This "moving target" presented to our attempts to settle on stable models that would permit credible economic assessment is best outlined by enumerating the recent **technical** and **marketplace** dynamics - and their expected impact on any ATV cost analysis:

3.1 Technical:

- o The unprecedented and quite decisive movement among major ATV proponents to alter former strategies and instead pursue all-digital terrestrial transmission systems - entails a significant overall cost impact.
- o The new studies on digital data reduction techniques - within ATSC and SMPTE - for possible application to the distribution and storage of HDTV program production material - suggest a significant potential cost impact on broadcast plant.
- o The completion - within SMPTE - of the basic work on development of a digital representation of an HDTV production format has helped clarify costs for certain HDTV equipment.
- o The widening studies on the special requirements of future broadcast ATV studio systems within ATSC and SMPTE are introducing issues that have potential cost impact.
- o The growing involvement of the U.S. computer industry within HDTV standardization activities is bringing attendant new perspectives on signal formats, performance - and costs. A sharp disparity currently exists between the television and computer industries on the likely convergence of ATV receivers and future computer displays and the associated economies of scale. Recently proposed concepts by the computer industry also introduce a possible cost impact on HDTV studio/post production equipment.

? Marketplace:

- o A growing number of papers presented by U.S. broadcasters at HDTV-related conferences throughout 1990 speculated on U.S. ATV scenarios which see the introduction of alternative media ATV services preceding that of any terrestrial broadcaster. Possible effects on the broadcast macroeconomic picture are envisaged.
- o New information from two broadcast networks on their ATV transition scenarios - and the associated costs - introduced important new economic perspectives.
- o A growing recognition that the HD VCR will likely emerge within the same time frame as the ATV broadcast service (terrestrial, DBS or Cable) resulted in a strong desire being expressed within the Systems Subcommittee to examine the impact of this on ATV receiver penetration - and the related cost impact.
- o The appearance of the first HDTV receivers in Japan (to support the imminent MUSE DBS Service) with price tags considerably higher than anything envisaged by our early WP-3/WP-5 conjectures - raise significant questions about some of our underlying economic assumptions.
- o Increasing discussion of the widescreen NTSC (or possibly EDTV) system being a marketplace-driven stepping stone to ultimate implementation of a digital HDTV service further downstream has profound implications on the macroeconomics of ATV.

4.0 LOADENING PERSPECTIVES OF WP-3 DURING PHASE 3:

SS WP-3 held five meetings since the last (Third) Interim Report - bringing to a total twenty-two meetings held to date.

Four of these meetings were joint meetings with other Working Parties:

March 14, 1990	Joint meeting of SS WP-3 with WP-5 (on Market Penetration) of the Planning Subcommittee
April 25, 1990	Meeting SS WP-3
August 23, 1990	Joint meeting SS WP-3 and PS WP-5
October 24, 1990	First joint meeting of SS WP-3 with WP-2 (on Transition Scenarios) of the Implementation Subcommittee
January 22, 1991	Second joint meeting of SS WP-3 and IS WP-2

The impetus for this series of joint meetings sprang from the growing recognition of an important convergence in the work of many who are currently involved within the FCC ACATS in examining the micro and macro issues related to the introduction of any of the proposed ATV transmission systems.

As the work of WP-3 progressed during the past year it became increasingly clear that any credible economic assessment of an ATV system must include:

- o Detailed examination of the total ATV system
- o Close scrutiny of ATV transition scenarios for broadcasters and how they affect the specific ATV system evolution over time
- o Attempts to better define the impact of all-digital transmission on transmitter/antenna costs
- o Knowledge of how the coexistence of an ATV system and the on-going NTSC system affect the total broadcast infrastructure
- o An examination of other market driving forces that could impact the rate of penetration of ATV into the consumer homes. Typical of such forces are the HD VCR, and ATV transition scenarios in other regions of the world.
- o The effects of relationships between alternative media (similar standards or not, technical synergies, competitive dynamics)
- o Projection of the economies of scale that might be introduced by non broadcast applications of HDTV (particularly if common production standards could be adopted).

5.0 TLINE OF WP-3 SPECIFIC AREAS OF ANALYSIS:

There are four components to the current WP-3 economic assessment studies of the ATV proponent systems:

5.1 Proponent ATV Hardware:

Cost analysis of the ATV encoder (specific hardware required to format the signal for transmission) and the ATV decoder (required in the associated ATV receiver). This cost assessment will be made based on detailed hardware/software information (supplied by each ATV proponent) and on equipment quantities relating to the expected marketplace implementation of the system (supplied by SS WP-3/PS WP-5 models).

5.2 ATV System:

Cost analysis of the associated ATV broadcasting system. This will be done for a typical local station and for a generic network infrastructure. This must identify specific requirements (for a given ATV system) relating to antennas, transmitters, local links, and the special complexities of a broadcast plant that supports simulcast ATV/NTSC program origination and transmissions. From the broadcasters viewpoint - this constitutes the most critical financial aspect of implementing an ATV service.

5.3 ATV Transition Scenarios:

Development of a realistic model(s) of the transition scenario(s) for broadcasters to convert from the current NTSC-only service to an ATV/NTSC simulcast service. This is necessary to realistically assess the quantities of ATV broadcasting equipment required over time - thus allowing sensible manufacturing economies of scale to be applied to these products.

5.4 ATV Receiver Penetration:

Development of a credible model for the ATV home receiver market penetration. Such a curve is pivotal to allow assessment of the manufacturing cost of introduction of an ATV receiver and how these costs will behave over time as sales volume grows.

6.0 ATUS OF WP-3 ANALYSES:

A reasonable overview of the present status of the work of WP-3 is best summarized by a review of our progress on each of the four elements of the work program described in Section 5.0:

6.1 ATV Encoder/Decoder Costs:

There has been little effort expended in this area - for the same reason we reported in the Third Interim Report: no hardware information is as yet forthcoming from the ATV proponents. This is understandable - given the pressure of their own work schedules as they prepare preliminary prototypes for ATTC testing.

Preparatory to this specific assessment by WP-3, we have, however, accomplished an important progress within our ATV Receiver Specialist panel. Working within the EIA Consumer Electronic group, a group of cost engineers from six prominent television receiver manufacturers (some of whom are ATV proponents) have converged on a generic ATV receiver block diagram - a model to permit cost assessment. Initial contacts have been made by the panel with Zenith, Sarnoff and Philips personnel on the cost implications of their systems.

It is hoped that the next phase of our work (which coincides with the onset of ATTC testing of the proponent systems) will continue the dialogue with the ATV proponents. WP-3 recognizes that the prototype hardware submitted to ATTC will, in all likelihood, be still far-removed from final product. Nevertheless, we feel such hardware will allow us a first opportunity to grapple with reality. We place high importance on general discussion with each proponent - centered about the hardware prepared to date. A modus operandi to formalize this work will be developed at the next meeting of WP-3.

6.2 ATV Broadcasting System:

The Specialist Group on Terrestrial Broadcasting have made significant progress in refining the system block diagrams that function as models for ATV system economic assessment. Three proponent systems have been examined so far within the context of these preliminary block diagrams:

ACTV (Single Channel Receiver Compatible) System of ATRC
(Advanced Television Research Consortium)

Narrow Muse (Dual Channel Simulcast) system of NHK

Channel Compatible Simulcast system of Zenith

These block diagrams are shown in **Appendices I and II.**

3 ATV Transition Scenarios for Broadcasters:

The preliminary (and somewhat premature) cost analysis of a typical local station conversion to ATV made by WP-3 in 1989 had, in retrospect, a major impact within the broadcast industry. The now infamous "\$38 million" number got wide press and generated a wide range of reactions - ranging from disbelief, negative commentary, to skepticism. The latter had a galvanizing effect in a number of circles as various experts within the broadcast community initiated studies of their own to examine our preliminary findings.

During the past few months, PBS and CBS alerted us that their internal examinations of how they might convert their networks to a simulcast ATV service had separately produced an entirely different economic approach to ours. In a preliminary presentation made by each to a joint SS WP-3 and PS WP-5 meeting on August 23, 1990, it was clear that important new information was indeed emerging. Of special significance was the transition scenarios being developed by both networks - and their common assumption that digital terrestrial transmission would most likely materialize as the U.S. methodology. The latter appeared to radically alter the cost scenario for transmitters and antennas (lowering them compared to the early WP-3 model) - while the former showed that in practice, while ATV conversion costs would be quite high, they would in fact be incurred over many years as a multi-step transition scenario was progressively implemented by broadcasters.

Of significant interest also to WP-3 were the system block diagrams being developed by PBS (especially) and CBS of a future network implementation that envisaged conventional NTSC systems co-existing with the new ATV systems. **Appendices III** and **IV** illustrate the basic approaches of these two networks.

These block diagrams reflected new concepts of how ATV signals might be originated, recorded, and distributed within the plant. While somewhat radical (at least at this early phase), these concepts clearly indicated serious attempts to seek cost effective solutions to ATV system implementation.

At the urging of WP-3, PBS and CBS agreed to formally present a more "fleshed-out" version of their studies (following consultations with each other) to a joint meeting of SS WP-3 and IS WP-2 (on Transition Scenarios) on October 24, 1990. This meeting produced a stimulating discussion - particularly focused on the underlying assumptions of PBS and CBS. Some of these assumptions were vigorously challenged - as a consequence of which further areas of study were identified.

It should be noted, that in one sense, analysis by WP-3 showed no significant disparity between the total costs initially developed by WP-3 for conversion for a local station to an ATV broadcast-operation - and those of PBS and CBS - if fixed equipment costs were assumed. Assumptions on specific HDTV studio equipment costs were reasonably close in all cases.

However, the CBS analysis assumed a specific model to describe the progressive lowering of such costs as more stations converted over time and manufacturing volume increased correspondingly. This specific model was challenged by WP-3. However, the importance of using such a model was acknowledged by all as being very important to our assessments - so consequently WP-3 will focus on developing a version considered closer to reality. Such a model, coupled with the key point made by both CBS and PBS - that conversion to ATV will actually take place over a span of years - does show the broadcast industry that conversion can be phased to better meet individual annual capital budgets. The identification of logical transition steps was also an important contribution. In both the CBS and the PBS studies, transmitter and antenna costs were substantially lower than those envisaged by WP-3's initial analysis - this being, of course, a consequence of the CBS/PBS assumption of an all-digital transmission system being successfully implemented at considerably lower power (and providing adequate coverage).

Over-riding all of our discussions there emerged the realization that the broadcast infrastructure (network and local station) is going to be profoundly altered by a conversion to ATV. The recent announcements by three of the proponents that they were advancing to all-digital transmission schemes lent weight to the growing acknowledgement that digital implementation of the future ATV broadcast plant was inevitable. This, coupled with the system block diagrams of WP-3 and those of CBS/PBS have exposed the fact that we still have a long way to go to define a realistic system implementation. A second joint meeting of SS WP-3 and IS WP-2 was accordingly scheduled.

At the January 22, 1991 Joint Meeting of WP-3/WP-2, the digital system issue continued. What was widely acknowledged here was our dependence on some key technical studies currently underway within other HDTV/ATV committees on system topics specifically germane to our work. Notable among these are:

- o **Ad Hoc Group on Studio System Issues** - within the SMPTE Working Group on Advanced Television Production. This is a Working Group specifically tasked by SMPTE to develop studio ATV standards for broadcasters.
- o **Specialist Group T4S5 on Data Compression of HDTV Production Signal** - within the Technology Group T4 of the Advanced Television Systems Committee (ATSC).

While there is no formal working liaison between FCC ACATS and ATSC or SMPTE - there is, fortunately, a considerable overlap in membership. WP-3 feels this will suffice to allow the necessary dissemination of information to expedite our continuing refinement of the broadcast ATV system.

1 ATV Receiver Penetration:

No topic is proving more elusive than that of an ATV penetration scenario acceptable to WP-3. At the urging of WP-3, the Working Party 5 (on Economic Factors and Market Penetration) early in 1990, resumed its examination of this topic.

WP-5 explored some additional dynamics in the marketplace which produced some revisions to their initial ATV receiver penetration rate (first published in 1988):

- o The effect of incremental U.S. receiver price decreases translating into U.S. ATV receiver penetration levels according to consumer's price elasticity of demand for ATV technology. As a first estimation of the resulting penetration rate increase a hypothetical price elasticity of - 1.75 was selected.
- o The effect of a global ATV marketplace development. Again, a hypothetical scenario that envisaged Europe and Japan collectively involved in total world ATV demand (the rest being in the U.S.) was selected to see how this would modulate the penetration rate model.

Appendix V shows the new penetration curves associated with these new considerations.

The most controversial assumption underlying the work of WP-5 is that the U.S. consumer will not perceive the ATV viewing experience as a television enhancement of the same dimension as that of color over monochrome television some four decades ago. Even WP-3 members remain quite divided on this issue. Our continuing debate on this topic is vital - because this pessimistic assumption has a profound dampening effect on the ATV receiver penetration curve.

6.4.1 The Issue of the Consumer Judgement on ATV:

Our discussions have unanimously concluded that a critical piece of information is missing from the entire FCC ACATS process: the reaction of U.S. consumers to an ATV image. The protracted, intense technical debates still on-going within numerous committees on the optimum technical parameters to be sought for within an HDTV/ATV image (and its related standard(s)) have confined the examination within primarily engineering circles - and circumvented the important voice of program producers and consumers.

A number of organizations (MIT, HBO, Canadian consortium) have attempted preliminary "audience research" among consumers exposed to HDTV. Various conclusions on consumer future television desires - and their willingness to pay for these - were drawn from the data collected. However, all of these studies shared the same inadvertent, but fundamental, flaw: the consumer was never exposed to the imaging attributes that really separate HDTV pictures from those of conventional 525

MTC pictures. All of the tests were conducted on classical engineering subjective test basis. The issue of what program producers will create as they exploit the substantial increase of electronic imaging information, namely, **wider angles of view presented on substantially larger and wider screens** has not yet entered industry scrutiny. How the consumer will respond to such images, accompanied by **multi-channel CD quality audio**, is still totally unknown.

There are a variety of implications linked to this issue:

- o The final design compromises sought by all of the ATV proponents would be considerably helped by a knowledge of what the consumer would judge to be an enhanced viewing experience.
- o The knowledge of what screen size is required to adequately portray the full potential of such imagery is crucial to the ATV receiver manufacturer. Such a display has already been identified by WP-3 as the most critical cost element within the ATV receiver.
- o Finally - a better understanding of ATV picture criteria (in the home of the consumer) would reflect back through the entire ATV system and allow pragmatic compromises to be made in the broadcast studio origination equipment required to ensure such received images and sound. The urgently sought cost-effective implementation of an ATV broadcast plant would thus be better supported.

WP-3 voiced regret at our recent January 22nd meeting that PS WP-7 on Audience Research have been unable to execute the identified research program on consumer reactions to ATV. We strongly believe this to be a fundamental flaw within the entire Advisory Committee process - and we wish to formally draw notice to this.

7.0 ISSUES IDENTIFIED AND FUTURE STUDIES:

Any attempt to analyze an ATV proponent's hardware in isolation has little meaning. The three year's work of WP-3 has progressively embroiled us in the macro economics of an ATV service. Further, a grasp of the details of a future ATV total broadcast system is absolutely essential if any credible attempt is to be made to analyze the cost of conversion of a local television station - and the expected substantial cost of network conversion.

It is the preliminary conclusion of WP-3 that ATV receivers designed to the different systems proposed will inevitably differ in their manufacturing cost - but not by a great amount. We place a priority on acquiring some grasp of the absolute cost to be expected at the time of introduction. As market penetration rises and consumer dynamics attain normal dimensions, these costs will drop sharply - and any differences between systems will converge even more. But the shape of that falling curve remains our goal - with the attendant information on time to achieve one percent market penetration, the cost of the receiver at that time to achieve 50% market penetration and again, the associated receiver costs.

On this basis WP-3 has listed the following items as the key components of our work program for our continuing into Phase 4:

ATV Broadcast Systems:

7.1 Industry Switch Over to All-Digital Systems:

WP-3 will try to get preliminary information from the relevant proponents.

7.2 Possibility of Data-Compressed ATV Signal Distribution Within Broadcast Plants:

Because of the enormous impact on routing switchers, and the significant impact (of modestly compressed ATV production signal formats) on future broadcast VTR's and associated program library management systems - WP-3 will examine this issue closely.

7.3 Identification of Systems Issues Unique to Broadcast Plants:

Because of their consequence on the ATV signal format structures, issues such as multi-channel digital audio, ancillary signals, test signals, control signals - and the possibility that all or some of these may require multiplexing with the HDTV video signals - WP-3 will expand our efforts to clarify such issues.

7.4 Clarification from IS/WP-1 of What is Entailed Within a Simulcast Service:

Does a simulcast service require that all programs broadcast on the NTSC channel be also transmitted on the ATV channel, or that every program transmitted on the ATV channel be also

broadcast on the NTSC channel? This impacts considerations of up and down-converter requirements in the station.

ATV Receiver:

7.5 WP-3 Will Continue Liaison with PS WP-5 in refining the ATV receiver penetration model. The effect of other delivery media simultaneously bringing ATV programming to the home will be examined.

7.6 The WP-3 ATV Receiver Specialist Panel Schedule Conferences with the Proponents will gather whatever information possible on the decoders associated with the new digital transmission systems - and refine their cost estimating model accordingly.

7.7 The Receiver Specialist Panel will Make ATV Cost Estimates at the start of production and through the learning curve. They will also vary some key assumptions and ascertain their cost sensitivity.

APPENDIX I

WORKING PARTY 3 SYSTEM BLOCK DIAGRAMS FOR ATV LOCAL STATION TERRESTRIAL BROADCASTING

We show here in simplified form some of the system block diagrams we have developed within the WP-3 Specialist Group on Terrestrial Broadcasting.

Figures 1 through 4 show the total **local station operation** - including:

- o Conversion of existing NTSC program material
- o Related microwave channels
- o Transmitters
- o ATV local studio production and post production
- o ATV core equipment
- o ATV news operation

Figure 1 shows the local station system implemented for the ATRC system. The production format used within the plant is **widescreen 525**.

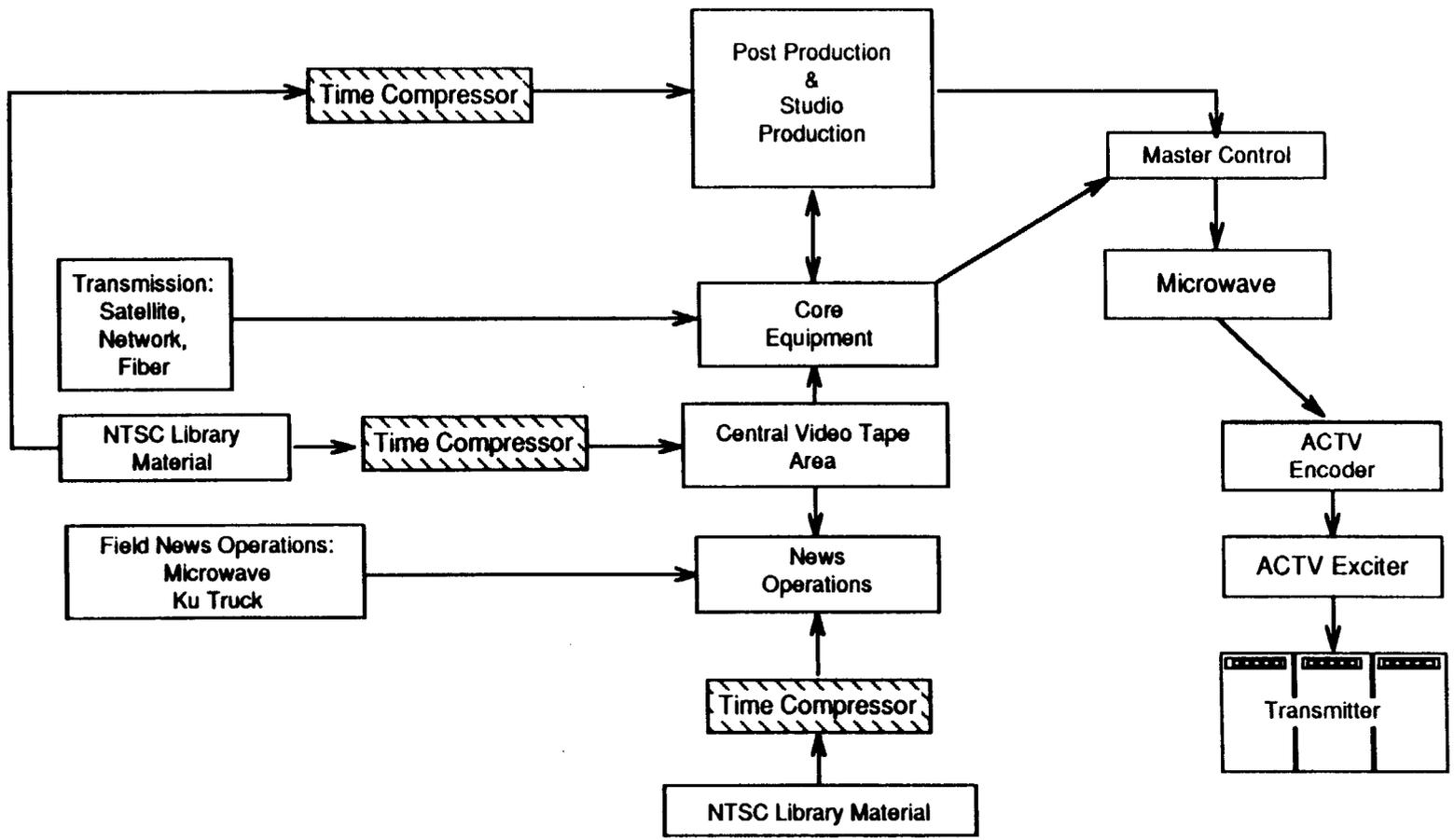
Figure 2 shows the local station implemented with the **Zenith System #1**. The key assumption made here is that the ATV Encoders are of low enough cost that they can be installed on all equipment. The HDTV production format is **787.5/59.94/1:1**.

Figure 3 shows an alternative example of the **Zenith System implementation #2** - where the video signal distribution within the plant is not the 787/59.94/1:1 HDTV production format - but instead is the time compressed version of this signal that is produced by the Zenith transmission encoding. WP-3 is interested in exploring the economic considerations of these two separate system implementations.

Figure 4 shows the local station implemented for the **NHK Narrow Muse** system. Here, the HDTV production format is **1125/60**.

Figure 5 is a block diagram showing the local station studio origination system for the ACTV-1 system. The production format is widescreen NTSC.

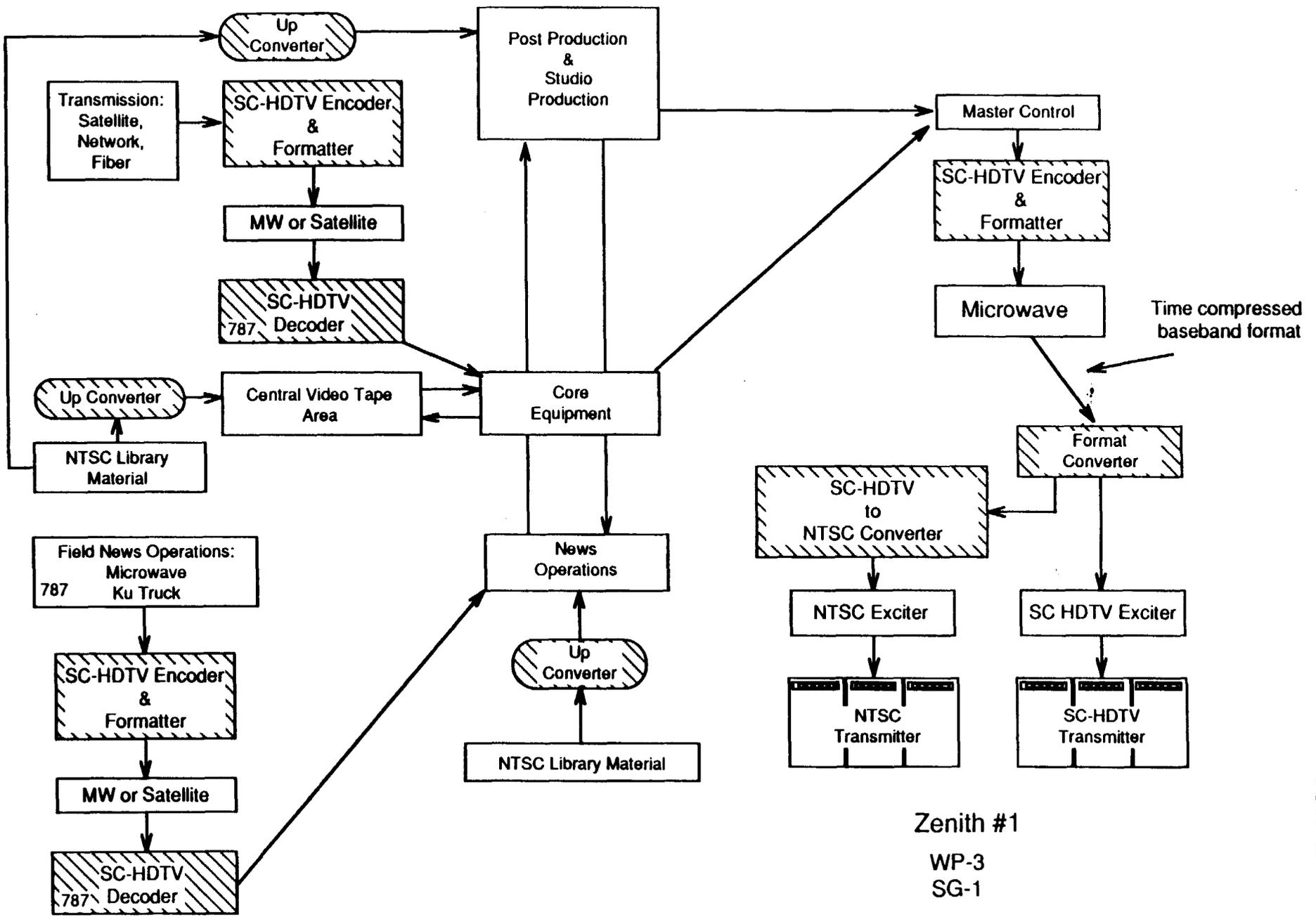
Figure 6 is a block diagram showing the local station studio origination system for the **Zenith #2** system. The production format is 787.5/59.94/1:1 - but the intra-plant distribution format is the ATV Zenith encoded form of the signal.



Format is Widescreen 525

ACTV
 WP-3
 SG-1

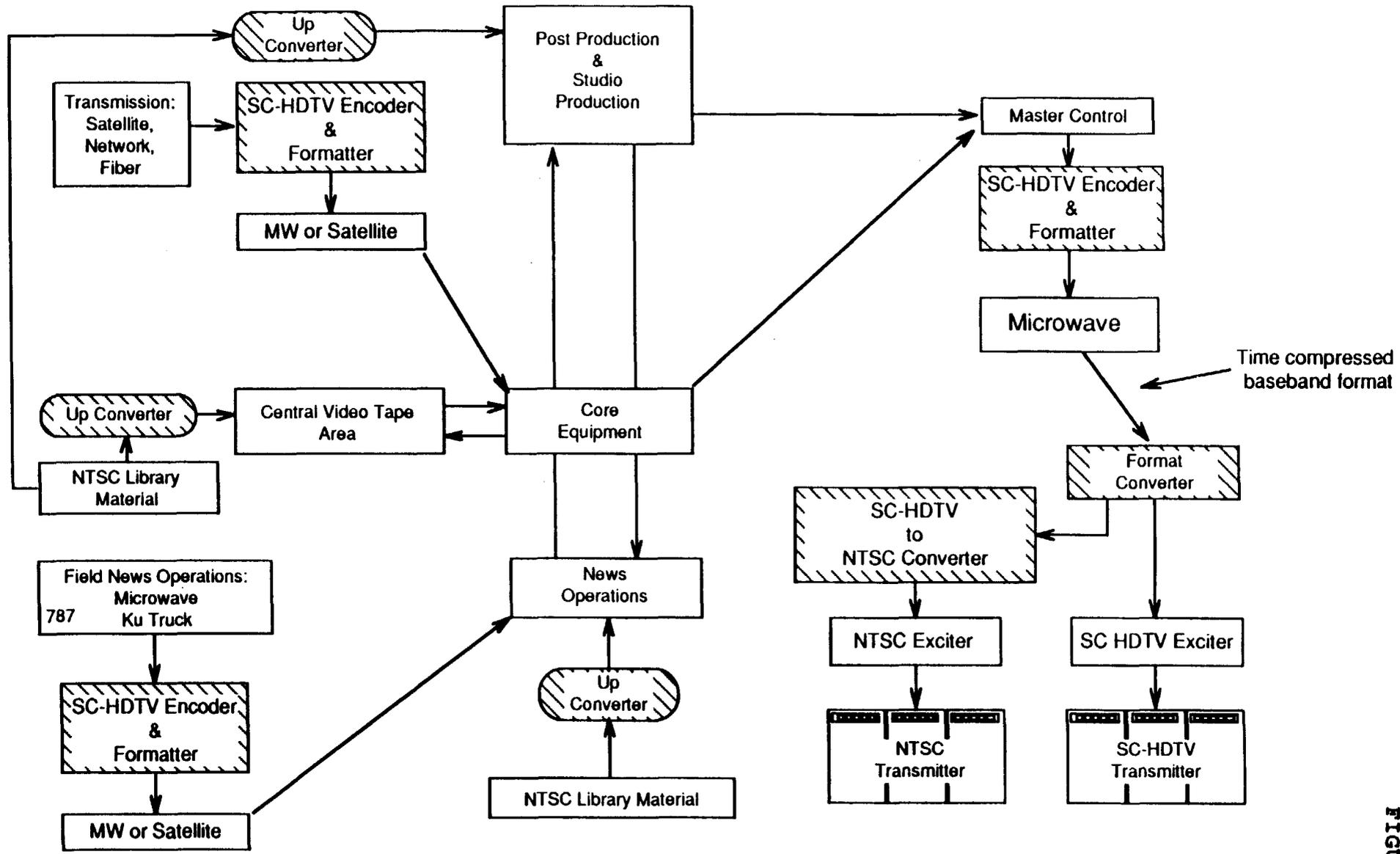
FIGURE 1



Zenith #1
 WP-3
 SG-1

Production format is 787/59.94, 1:1

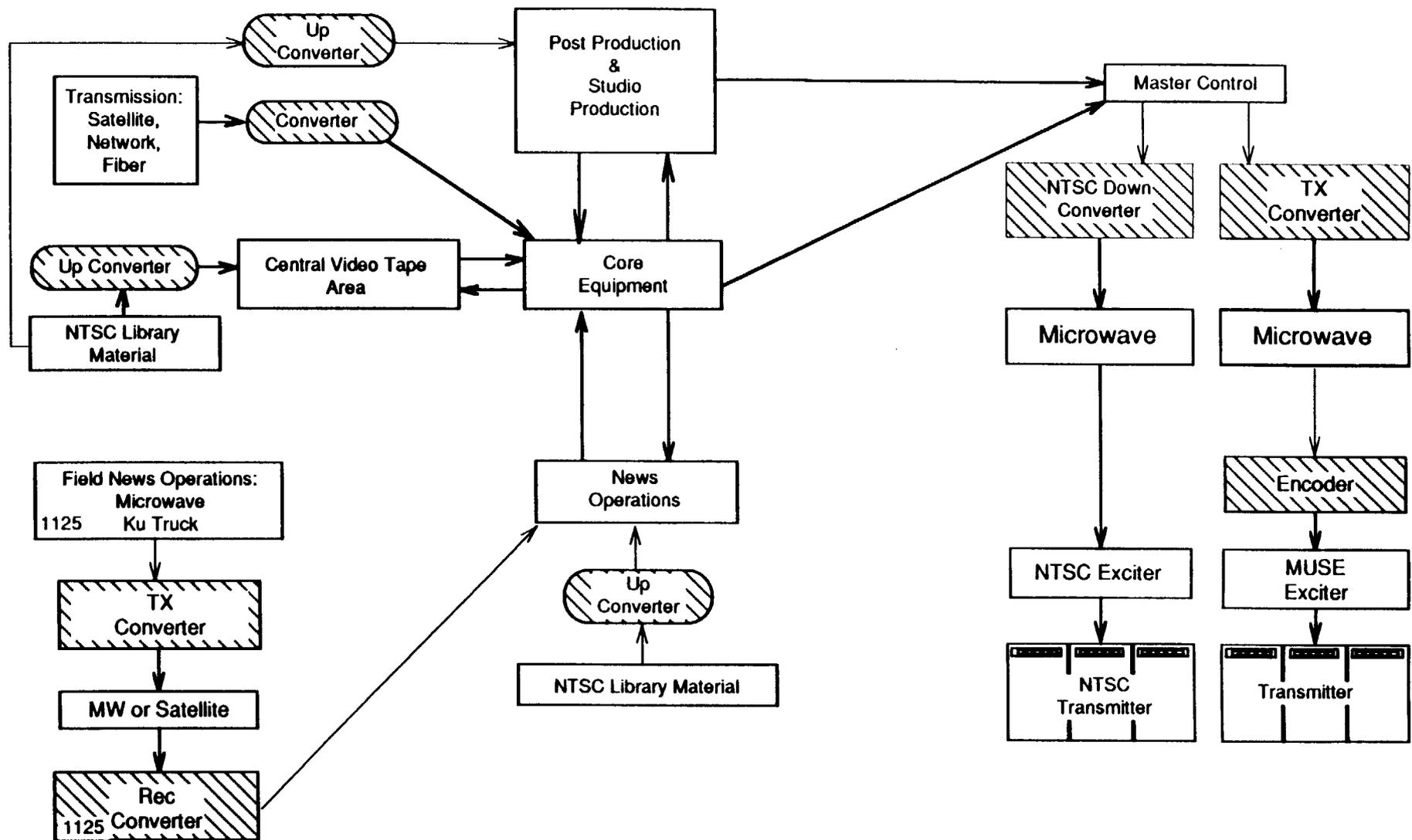
FIGURE 2



Zenith II
 WP-3
 SG-1

Production format is 787/59.94, 1:1
 Plant format is Zenith Time Compressed

FIGURE 3



Production format is 1125/60

NHK
WP-3
SG-1